MASURSKY LECTURE: RETROSPECTIVE ON THE U.S. ANTARCTIC METEORITE PROGRAM, OR: FUN AND GAMES WITH ANTARCTIC METEORITES, OR: FROZEN TOES AND FROZEN METEORITES; W. A. Cassidy, *Department of Geology and Planetary Science, University of Pittsburgh, Pittsburgh, PA 15260*

As geologists, we are taught always to ignore the talus and study the outcrop. But suppose we could never climb to the outcrop? By now, geologists would have figured out all sorts of clever ways to extract information from the talus about the inaccessible outcrop above it. This, of course, is the situation faced by meteoriticists: meteorites are samples of the talus from an outcrop that is either inaccessible to us, or that no longer exists. A further complication is that in the aggregate, meteorites must represent many different outcrops, and we are called upon to sort these out, devising many ingenious ways to study them in a meaningful way. So, historically, we have searched the world in order to accumulate as many separate falls as possible, hoping thereby to come to know the full range of unearthly environments within which rocks form. Only recently, however, have we begun to reach for meteorites in Antarctica where, as we all know by now, astonishingly high *concentrations* of meteorites can be found on certain patches of ice.

The first Antarctic meteorite ever found was a 1 kg L5 chondrite discovered during Douglas Mawson's Australian Antarctic Expedition in 1911-1914. The distinction of finding this specimen belongs to an unnamed member of an exploration party led by Mr. F.H. Bickerton, whose mission was to explore and map westward from Mawson's base at Cape Dennison, in Commonwealth Bay on the Adelie Land coast.

Three other meteorites were found subsequently at widely separated points in Antarctica: the second one after Adelie Land, an iron, was found almost 50 years later in 1961 on a southern spur of the Humboldt Mountains by Russian geologists mapping near their base, Novolazarevskaya; Antarctica's third, a pallasitic stony iron in two pieces, was picked up in 1961 on ice in a moraine below Mt. Wrather in the Thiel Mts. by geologists of the U.S. Geological Survey; and the fourth, an iron, was discovered in 1964 in the Neptune Mts. by geologists of the U.S. Geological Survey. At first glance, there was nothing to recommend the antarctic continent as a place where one could find many meteorites.

The first hints of the existence of *meteorite concentrations* on the ice came to us via the Japanese glaciologist Renji Naruse, who discovered a meteorite concentration on the ice surface at the Yamato Mountains, and from the initial chemical analyses of the first Yamato meteorites by the M. Shimas (husband and wife). Japanese scientists deserve great credit. They not only found the first meteorite concentration, but the initial Japanese discoveries over their first three meteorite collecting seasons finally convinced reluctant reviewers at the National Science Foundation to allow some of our own people into the field to search for meteorites in Antarctica.

The program that evolved is ANSMET (Antarctic Search for Meteorites). Earliest support for ANSMET came from Edward Olsen, who very early recognized the significance of the Japanese discoveries, Louis Rancitelli, who saw the potential to determine terrestrial ages of the antarctic meteorites, and Michael Lipschutz, who wondered about using ancient falls to detect changes in the meteorite flux at the earth. Our earliest help in the field work came from Japanese collaborators who helped us to survive while collecting meteorites on the East Antarctica ice plateau.

A novel concept in ANSMET is that we were seeing *concentrations of meteorites* for the first time. Attempts to understand this concept begin with Keizo Yanai's early thoughts on the antarctic ice sheet as a giant collector and transporter of meteorites, and Fumihiko Nishio's picture of vertical concentration through time. Whillans and Cassidy attempted a synthesis consisting of horizontal concentration to a stranding surface of trapped ice, vertical concentration through time at the stranding surface and direct infall onto the stranding surface. Modifications of this have been suggested by Gary Huss for the case of ice moving sluggishly over a barrier.

The ANSMET program has had a degree of success that could not have been foreseen at its beginning. Because of the great numbers of meteorite specimens recovered, it has generated a number of related ideas concerning ice sheet dynamics, cosmic dust collecting in Antarctica and searching for meteorites in the hot deserts of the world. These ideas may have resulted in part from early decisions to make the ANSMET field experience available to as many scientists as possible and to internationalize the field teams.

Expeditions to explore Antarctica began in earnest in the early part of this century. Why, then, were meteorite stranding surfaces not discovered earlier? In general, ice patches were avoided: they are impossible for dog sleds, and even snowmobiles must be fitted with special cleats to be able to travel on ice. In addition, they appeared to be featureless and uninteresting; inviting only a detour around them. Another factor is the existence of tunnel vision. A paleontologist crossing an ice patch, for example, would find the fossiliferous rocks while perhaps kicking the meteorites out of the way. A meteoriticist would do just the opposite, missing fossil bone fragments but finding meteorite fragments. Naruse, a glaciologist, must have had exceptionally wide-angle vision.

The 1997 ANSMET field team, led by Ralph Harvey, has recently returned with approximately 400 new specimens from the "meteorite city" location, near Elephant Moraine. This marks the successful conclusion of the 20th ANSMET field season in Antarctica, during which more than 8000 specimens have been returned. According to some approximate calculations, the cost of recovering each specimen has been around $2500.00. Some of these have a higher relative value than others, of course. As the second part of this presentation, Robert Pepin will discuss one of the relatively more valuable ones.